OBSERVATIONS OF *POTAMOGETON HILLII* MORONG IN NORTH AMERICA

C. Barre Hellquist

ABSTRACT

Potamogeton hillii Morong has been considered as either a rare or endangered species in all states and provinces where it occurs. Currently it is under review by the United States Fish and Wildlife Service for possible listing under the Endangered Species Act of 1973. Prior to 1960 it was collected at 25 localities. Since 1970, 78 new localities have been discovered. Throughout its range this species is mostly found in regions of limestone bedrock. Presently it is most abundant in western New England and northern Michigan, and during 1982 was relocated in Connecticut and Ohio. *Potamogeton hillii* appears to be spreading in the limestone regions where it presently occurs. This taxon is found growing in clear, cold waters of small streams, ponds, and beaver ponds with muddy substrates. The abundant winter buds and fruits produced apparently guarantee the continued spread of this species. *Potamogeton hillii* should not be considered further for protection nationally, nor should it be so listed in the states where locally abundant.

Key Words: *Potamogeton hillii, Potamogeton porteri,* Potamogetonaceae, *Pusillii,* rare, endangered species

Potamogeton hillii Morong (including *P. porteri* Fern.) is a distinct member of the subsection *Pusillii* of the Potamogetonaceae. It was named for Rev. Ellsworth J. Hill (1833–1917) who was first credited for collecting it near Manistee, Michigan on August 5, 1882 (Fernald, 1932). A study of specimens produced four earlier collections, originally identified as other taxa. The oldest known locality is from East Dorset, Vermont in 1857. *Potamogeton porteri* described by Fernald (1932) from Lancaster, Pennsylvania has been shown by Haynes (1974) to be *P. hillii.*

Fernald (1932) knew of nine localities for *Potamogeton hillii* in northeastern United States. Voss (1965) discussed the failure to relocate the type locality in Manistee, Michigan, but noted that only two new populations had been located up to 1965 in Michigan. Haynes (1974) indicated the presence of a number of new localities from Michigan and New York. Weber (1940) first reported *P. hillii* from Massachusetts, and Hellquist (1977) reported eight new localities for Massachusetts.

The apparent rarity of this species led to its listing by the Smithsonian Institution (1975) and Ayensu & DeFilipps (1978) as a

threatened species in the United States. Individual state, provincial, and regional lists have variously classified *Potamogeton hillii* as rare, threatened, endangered, or extinct. These lists are: Vermont (Countryman, 1978); Massachusetts (Coddington & Field, 1978); New England (Crow, 1982; Crow *et al.*, 1981); New York (Mitchell *et al.*, 1980; Mitchell & Sheviak, 1981); Pennsylvania (Wiegman, 1979); Ohio (Ohio Department of Natural Resources, 1982); Michigan (Wagner *et al.*, 1977); and Ontario (Argus & White, 1977). *Potamogeton hillii* was omitted from the Connecticut list (Mehrhoff, 1978) even though only a single location was known at the time. The results of these surveys prompted its appearance in the Notice of Review published by the United States Fish and Wildlife Service, Office of Endangered Species in the Federal Register (FR, 15 December 1980, Vol. 45, No. 247) as a potential candidate for listing, but needing further study.

Observations made in the field from 1972–1976 (Hellquist, 1977) indicated population patterns that led to increased success in locating this species. The result of the field work was the discovery of 54 new localities for *Potamogeton hillii* since 1976.

Field observations on *Potamogeton hillii* have shown it to be a species found in clear, cold, alkaline water in small, slow flowing streams, ponds, and beaver ponds with a muddy substrate. In streams, it often appears on the upstream side of road culverts where more marshy conditions occur. In beaver ponds and marshes, it often grows among stumps and fallen trees, or in shallow water among rushes and sedges. In ponds, *P. hillii* is occasionally found in deeper waters up to 1.5 meters.

Potamogeton hillii has rarely been reported from lakes. Specimens previously identified as being collected from Cayuga Lake, N.Y. were studied by Fernald (1932) and found to be the Red Mills Pond population. No other specimens have been seen from the lake. Wiegand and Eames (1925) listed locations previously reported from central New York in a work by Dudley (1886). These localities were: Dryden Lake, Red Mills Pond, pools north of Ithaca, and Myers Point. Richard Mitchell (pers. comm.) indicated that Clausen had observed *P. hillii* in the marshes at the south end of Cayuga Lake. This area has been recently filled and commercially developed. *Potamogeton hillii* occurs around the Great Lakes at Manitoulin Island, Lake Huron and Cecil Bay, Lake Michigan. The Cecil Bay population was along the shore at the outlet to French

Farm Creek. I observed in 1975 a few plants directly at the mouth of the creek. In 1977 the waters of Lake Michigan had receded and I located no plants; a subsequent check in 1983 also failed to locate any *P. hillii*.

The alkalinity of the water is an extremely important chemical character controlling the distribution of *Potamogeton hillii*. Water samples from 35 localities indicate that *P. hillii* occurs in waters ranging from 53.0–290.0 mg/l $CaCO_3$ with a mean of 124.1 mg/l $CaCO_3$. A survey of the geological maps and reports of the states, provinces, and regions where *P. hillii* is known to occur have shown that 79% of the locations coincide with bedrock of dolomitic limestone, 15% of calcitic marble, micacous crystalline marble, and limestone, 3% of shale, 1% of gneiss, 1% of conglomerates, and 1% of sandstone [Vermont (Doll, 1961); Massachusetts (Emerson, 1916; Dale; 1923); Connecticut (Dale, 1923); New York (Dale, 1923; Fischer *et al.*, 1970); Pennsylvania (Frazer, 1877; Lesley, 1885; Pennsylvania Geological Survey, 1960; Stevenson, 1882); Ohio (Bownocker, 1947); Ontario (Morton, 1977; Salterly, 1958; Stauffer, 1914); Michigan (Marten, 1936a; 1936b)].

Water quality also appears to influence distribution of the taxon. *Potamogeton hillii* is mostly found in clear, cold waters, often around springs and small inlets in ponds and marshes. This taxon is only occasionally found encrusted with marl even though growing in highly alkaline waters. *Potamogeton hillii* is rarely found in turbid, stagnant, or polluted waters.

Potamogeton hillii most typically occurs with *P. foliosus* Raf., *P. natans* L., *P. pusillus* L. var. *tenuissimus* Mert. & Koch., *P. amplifolius* Tuckerm., and *P. gramineus* L. It is rarely found with other alkaline water species such as *P. strictifolius* Benn., *P. friesii* Rupr., and *P. pectinatus* L. (Hellquist, 1980) which are often associated with more eutrophic waters.

Potamogeton hillii is characterized by having short axillary peduncles and fruits with a small dorsal keel. The fruits of *P. hillii* are much larger than those of the closely related *P. foliosus* (see Haynes, 1974). The leaf tips are mostly bristled; this trait helps to distinguish it from sterile *P. foliosus* in which the leaf tips are merely acute. *Potamogeton strictifolius* typically forms bristle-tipped leaves but may be separated from sterile *P. hillii* by the presence of a bold margin around the leaf and distinct nodal glands. The bold margin in *P. strictifolius* appears similar to the more prominent leaf veins.

Haynes (1974) indicated the variability which may occur in the morphology of the leaf tips. While the bristle-tipped leaves are common, occasionally blunt-tipped or apiculate leaf tips are observed. These leaves appear to occur both on plants early in the growing season and during the latter portion of the season, especially on the winter buds.

Fernald (1932) stated that winter buds are not known for *Potamogeton hillii.* Haynes (1974) indicated he had observed winter buds on a few sheets of *P. hillii.* During October 1982, I observed in Vermont many plants of *P. hillii* with numerous winter buds; in many cases only the winter buds were present. These winter buds often had the central portion partially hardened, similar to those of *P. obtusifolius* Mert. & Koch, and *P. pusillus* var. *tenuissimus.*

Potamogeton hillii is occasionally seen with up to 5 veins, not 7 as previously reported by Hellquist (1977). When the venation is more than 5, *P. ogdenii* Hellquist & Hilton, a closely related but much rarer taxon, should be suspected.

Potamogeton hillii is known from nine states and provinces in the United States and Canada with a total of 108 locations having been reported (Fig. 1). The number of reported sites by states and provinces, (known verified locations in parentheses), are: Massachusetts 35(32), Vermont 24(19), Michigan 15(11), Ontario 12(10), New York 11(6), Pennsylvania 6(0), Ohio 3(1), and Connecticut 2(1). Currently *P. hillii* is known to be extant in all states except Pennsylvania. Seventy-five percent of all known localities for *P. hillii* have been found since 1970. As more field work is conducted in the proper habitats within the alkaline regions, more populations will surely be located.

Potamogeton hillii is locally abundant at most of its locations. The numerous winter buds and fruits produced apparently guarantee survival and facilitate spread of this species. *Potamogeton hillii* should no longer be considered for federal protection under the Endangered Species Act of 1973, and should likewise be dropped from consideration by the states of Massachusetts, Vermont, and Michigan. In these states it is well established and not in danger of extirpation.

The following list includes site information for all populations of *Potamogeton hillii* documented by herbarium specimens. In instances where many different collections were made at the same site only the earliest, or the earliest and latest, records are recorded.

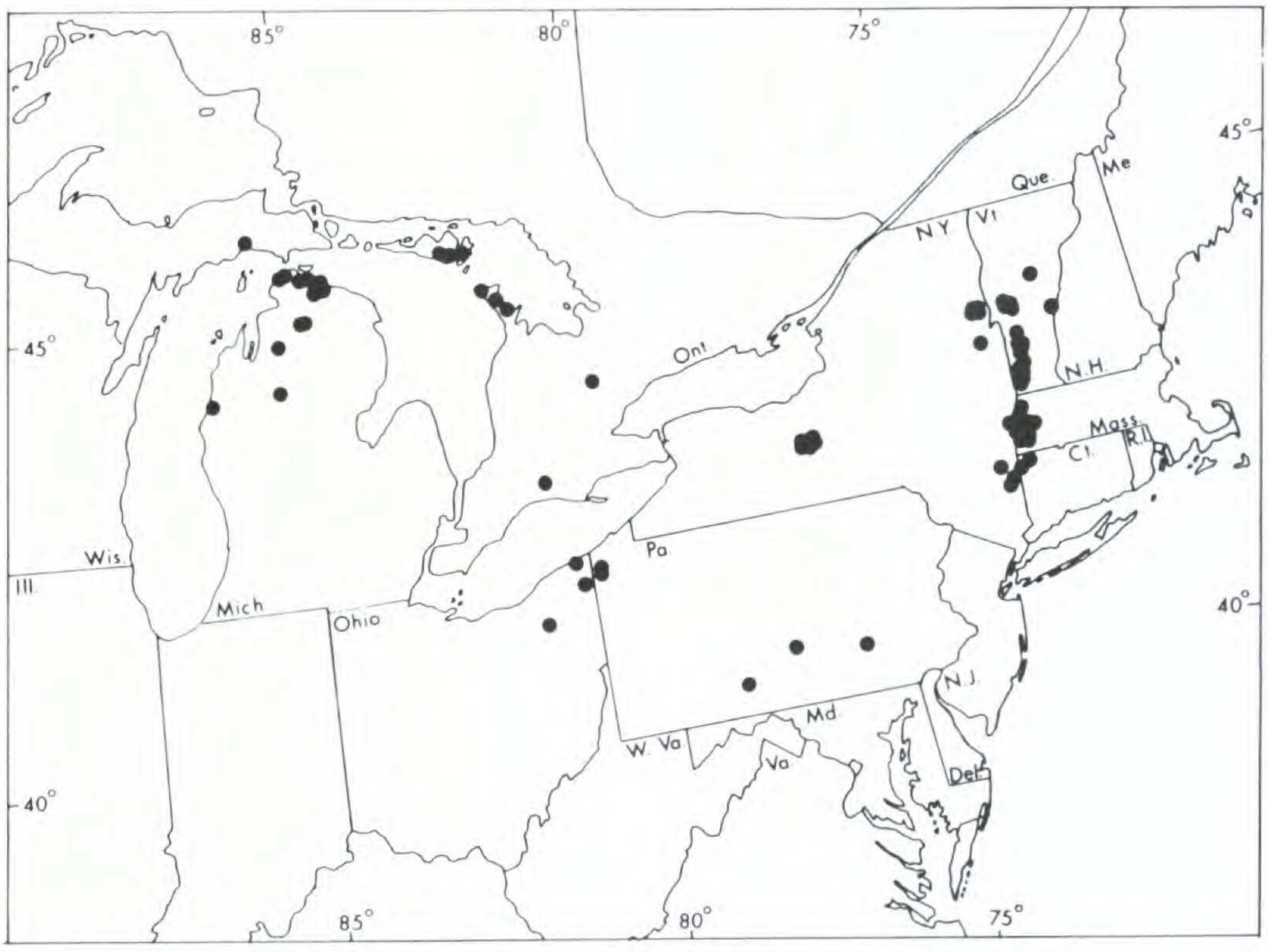

Figure 1. Distribution of *Potamogeton hillii*.

VERMONT: Bennington Co., Arlington, stream in cow pasture immediately east of Battenkill River on south side of Rt. 313, *Hellquist 15139* (NASC, NEBC); Arlington, small pond on the west side of Old Depot Rd. ca. 1/2 mile south of Rt. 7A, *Hellquist 15166* (MSU, NASC, NEBC, NYS, OS, UNA, VT); Arlington, marshy pond along Warm Brook on the east side of Old Depot Rd. south of Rt. 7A, *Hellquist 15165* (F, MO, MSU, NASC, NEBC, PH, US, VT, WAT); Arlington, in clear cool water among sedges in small pond on west side of Old Depot Rd. ca. 3/4 mile south of Rt. 7A, *Hellquist 15169* (CM, CU, DAO, NASC, NEBC, PAC, PH, VT, WAT); Arlington, small pond SW of town at Howell's Campground in shallow clear water, *Hellquist 15167* (NASC, PAC, VT); Arlington, small stream ca. 1/4 mile east of Rt. 7A along connection to new Rt. 7, East Arlington, *Hellquist 15175* (MICH, NASC, NEBC, NHA, VT); Dorset, in shallow water of Otter Creek, 1 Aug. 1934, *Eames s.n.* (GH, YALE); Dorset, Prentiss Pond west of town, *Hellquist 15175* (NASC, NEBC, VT); Dorset, East Dorset, 28 Aug. 1857, *Aames s.n.* (GH); Dorset, abundant in small pool east of railroad north of Village Rd. and immediately south of stream under railroad, East Dorset, *Hellquist 15423* (DAO, NASC, NEBC, NY, OS, VT, WAT); Manchester, among *Equisetum fluviatile* along shore of Battenkill River at old fishing access site of "Dufresne Pd.", *Hellquist 15172* (MICH, MO, MSU, NASC, NEBC, UNA, VT); Manchester, small pond near Rt. 7 in Dellwood Cemetery south of Manchester, *Hellquist 15196* (NASC, NEBC, OS, VT, WAT); Pownal, South Stream at fishing access, 30 July 1973, *Hellquist various numbers* (MASS, MICH, NASC, NEBC, NHA, OS, NLU, UCSB, VT). Orange Co., Washington, bog with *Rhamnus alnifolia, Seymour 29679* (VT). Rutland Co.,

Danby, common on east side of Rt. 7 in small pasture stream ca. 1.5 miles south of Danby-Wallingford town line, *Hellquist 15195* (NASC, NEBC, VT, US); Danby, common on west side of Rt. 7 in small pasture stream ca. 1.6 miles of Danby-Wallingford town line, *Hellquist 15405* (NASC, NEBC, NHA, US, VT); Hubbardton, uncommon in Giddings Brook along north side of Hill Rd. just west of Parsons School, *Hellquist 15422* (MO, NASC, NEBC, VT); Hubbardton, abundant in Giddings Brook south of Hill Rd. at jct. with Ganson Hill Rd., *Hellquist 15424* (CAN, DAO, NASC, NEBC, NY, NYS, UNA, US, VT); Mt. Tabor, shallow water, Otter Creek, *Eames 11643* (YALE); Mt. Tabor, common in small pond on east side of Rt. 7, 0.8 mile south of Danby, *Hellquist 15193* (NASC, NEBC, VT), Mt. Tabor, east side of Rt. 7, 0.8 mile south of Danby, *Hellquist 15193* (NASC, NEBC, VT); Mt. Tabor, east side of stream that crosses Rt. 7, 0.7 mile south of Danby, *Hellquist 15194* (DAO, MO, NASC, NEBC, NYS, VT); Pittsford, abundant along east shore of Smith Pd., Florence, *Hellquist 15403* (F, NASC, NEBC, NY, UNA, VT, WAT); Pittsford, small stream ca. 1/2 mile SW of Florence on road to Butler Pd., *Hellquist 15404* (MICH, MO, NASC, NEBC, OS, PH, US, VT). Windsor Co., Windsor, Evart's Pd. Aug. 1886, *Dudley s.n.* (GH, NY); Windsor, Evart's Pd., in deep water, 27 Aug. 1933, *Weatherby & Griscom s.n.* (NEBC).

MASSACHUSETTS: Berkshire Co., Alford, small pond on west side of West St. off Tom Ball Bk., 2 Aug. 1974, *Hellquist various numbers* (CUSC, MO, NASC, NEBC, NLU); Alford, marsh west of small pond on west side of West St. off Tom Ball Bk., 2 Aug. 1944, *Hellquist various numbers* (ALU, MASS, MO, NASC); Great Barrington, Muddy Bk, at Blue Hill Rd., 2 Aug. 1974, *Hellquist various numbers* (NASC); Great Barrington, Muddy Bk. at Stoney Bk. Rd., *Hellquist 10916* (ALU, NASC, NEBC, NLU); Great Barrington, flooded portion of Muddy Bk. north of Stoney Bk. Rd., *Hellquist 14050* (CM, NASC); Hancock, edge of pool, *Hunnewell 16997;* Hancock, small stream east of Rt. 43 ca. 1/2 mile north of Whitman Rd. on land owned by Eugene Reese, *Hellquist 14388* (NASC); Hancock, pond along Kinderhook Ck. east of Rt. 43 and north of Whitman Rd., *Hellquist 14389* (NASC); Lenox, pond in bird sanctuary, *Githens 208* (NASC, PH); Lenox, eighth pond in series of beaver ponds west of Rt. 7 along Yokun Bk., *Hellquist 13653* (NASC, NEBC); Lenox, East Branch, Yokun Bk., *Hellquist 13663* (NASC, NEBC); Lenox, beaver pd. along Yokun Bk., *Hellquist 13674* (CM, MICH, NASC, NEBC); Lenox, pond west of first beaver dam, west of Rts. 7 & 20, immediately behind the Yankee Motor Lodge ca. 1/2 mile south of Pittsfield line, *Hellquist 14403* (NASC); Lenox, pond west of second beaver dam, west of Rts. 7 & 20 behind the Yankee Motor Lodge, ca. 1/2 mile south of Pittsfield line, *Hellquist 14385* (NASC); Pittsfield, south end of Mud Lake at outlet, *Hellquist 15220B* (NASC); Pittsfield, beaver pond along west side of Tamarack Rd. ca. 1/4 mile south of South Mountain Rd., *Hellquist 15214* (NASC, NEBC, US); Pittsfield, beaver marsh on north side of Tamarack Rd. ca. 1/4 mile west of Bousquet Ski area, *Hellquist 15217* (CONN, CU, KANU, NASC, NEBC, NY, NYS, PH, SDC, US, VT); Pittsfield, pond south of dam at conservation park NE of Pittsfield airport, *Hellquist 15216* (NASC); Richmond, Cone Bk. at Lenox Rd. 6 Sept. 1972, *Hellquist various numbers* (ALU, CM, MICH, NASC, NEBC, NHA); Richmond, Miller's Pd., east of jct. of Rossiter Rd. and West Rd., *Hellquist 11837* (ALU, C, DS, MO, NASC); Richmond, Fairfield Pd., *Hellquist 11838* (ALU, C, DS, NASC); Richmond, Sherrill Pd. at jct. of Rossiter Rd. and Rt. 41, *Hellquist 13019* (CM, NASC, NEBC); Richmond, Crystal Lake on the west side

of Swamp Rd. ca. 1/2 mile south of Lenox Rd., *Hellquist 13676* (CM, MICH, NASC, NEBC); Richmond, pond on the north side of Summit Rd., *Hellquist 13681* (NASC, NEBC); Richmond, small pond on south side of Summit Rd., *Hellquist 13684* (CM, MICH, NASC, NEBC); Richmond, small pond along Fairfield Bk. on the north side of Sleepy Hollow Rd. ca. 1/2 mile east of Rt. 41, *Hellquist 14382* (NASC); Richmond, small farm pond on the west side of Rt. 41 ca. 3/4 mile south of the Pittsfield line, 1/2 mile south of North Cemetery, *Hellquist 14394* (CM, MICH, NASC); Richmond, small pond on south side of Canaan Rd., 0.7 mile east of the New York border, *Hellquist 15191* (MICH, NASC, NEBC, NYS, US); South Egremont, in 3 feet of quiet water of the inlet to the pond fed by Karner Bk., *Weber 1626* (BH, CAN, CU, F, GH, MICH, MO, NHA, NY, US); South Egremont, common in stream along the north side of Mt. Washington Rd. ca. 1/4 mile from jct. of Rt. 41 at SW corner of the Mill Pd., *Hellquist 15199* (F, MSU, NASC, NEBC, NYS, OS, PAC, PH, US); Stockbridge, swamp along the south branch of Lily Bk. at Bean Hill Rd., *Hellquist 11147* (NASC); Stockbridge, Kampoosa Bk. on west side of Rt. 7, ca. 1.0 mile north of Rt. 182, *Hellquist 15391* (CAN, NASC, NEBC, US); West Stockbridge, pond south of Wilson Rd. ca. 1/2 mile west of West Center Rd., West Stockbridge Center, *Hellquist 15389* (CAN, CM, CONN, CU, DAO, F, KANU, MICH, MO, MSU, NASC, NEBC, NHA, NY, NYS, OS, PAC, PH, SDC, UNA, US, VT, WAT).

CONNECTICUT: Litchfield Co., abundant in Flat Bk. at jct. of Rts. 126 & 63, *Hellquist 15200* (CAN, CONN, DAO, MICH, MO, NASC, NEBC, NYS, OS, PH, UNA, US, VT); Sharon, Indian Pd., 9 Sept. 1909, *Bissell s.n.* (NCBS, NASC).

NEW YORK: Columbia Co., Canaan, Beebe Pd. south of Beebe Pd. Rd., *Hellquist 9651* (MASS, NASC, NLU). Dutchess Co., Amenia, in deep mud and 0.7–2.0 m water of Amenia Lake, scarcely reaching surface, usually in large clumps to near 1.0 m diameter at top, *Eames 11794* (NASC, NYS); Amenia, marsh on west side of Rt. 22 ca. 1.5 miles south of Amenia, *Hellquist & Dean 15409* (CAN, CU, GH, MICH, MO, NASC, NY, NYS, OS, UNA, VT); Pine Plains, *Hoystadt s.n.* (NY). Thompkins Co., Dryden, Red Mills Pd., July 1895, *Dudley s.n.* (CU) [includes those distributed by Morong as collected by Dudley from Cayuga Lake, 1 Aug. 1886, *Dudley s.n., see:* Fernald, 1933, (CAN, F, GH, MICH, MO, US)]; Malloryville, near Malloryville, July 1886, *Dudley s.n.* (NYS). Washington Co., Putnam, abundant in small pool along Rt. 22 on west side near culvert, muddy bottom, ca. 2.0 miles north of Dresden Station Rd., *Haynes 3342* (GH, MICH, OS); Putnam, stream east of Road B at jct. with Rt. 22, north of Dresden line, *Hellquist 15189A* (CAN, CM, CU, DAO, MO, NASC, PH); Putnam, ditch in marsh on west side of Rt. 22 across from Road B ca. 0.1 mile north of Dresden town line, *Hellquist 15401* (CU, GH, KANU, NASC, NY); Putnam, Mill Creek ca. 0.5 mile south of Rt. 22 and south of Putnam Cemetery, *Hellquist 15190* (CAN, CM, CU, F, MICH, NASC, PH, WAT); Kingsbury, east of Vaughan's, South Beaver Creek, 17 July 1900, *Burnham s.n.* (CU, GH).

PENNSYLVANIA: Bedford Co., Woodbury, densely filling large Mill Pd. south of Woodbury, *Hotchkiss 6003* (GH, US); Woodbury, edge of dam, alt. 1210 ft., 1.0 mile SSW of Woodbury, 10 Aug. 1941, *Berheimer s.n.* (CM, PH). Crawford Co., Conneaut Lake, 14 Aug. 1869, *Porter s.n.* (PH); Harmonburg, 1889, *Whiteside s.n.* (GH). Lancaster Co., Lancaster, cold riverlets near Lancaster, 5 Oct. 1860, *Porter s.n.* (P, MO, NY, PH), [Type for *Potamogeton porteri* Fernald]. Mifflin Co.,

Newton-Hamilton, in Beaverdam Run at Brush Run School, 2 miles NE of Newton-Hamilton, Westerfield *16619* (NYS, PAC, PH).

ONTARIO: Bruce Co., Albermarle Twp., Hope Bay, Albermarle Bk. by road south of Hope Bay, Bruce Peninsula, in sluggish brook, 24 Aug. 1977, *Morton & Venn s.n.* (CAN, MICH, WAT); Lindsay Twp., partially dried-up ditch on east side of Brickman's Corner-Cape Chin Rd., 0.1 mile north of Miller Lake East Rd. *Hellquist & Hellquist 15385* (CAN, DAO, MICH, NASC, PH, UNA, US, WAT); St. Edmunds Twp., ditch connecting into Willow Ck. on north side of Rt. 6, 1.5 miles north of radio tower and 2.7 miles north of Hidden River Rd., *Hellquist & Hellquist 15384* (CAN, CU, DAO, GH, MICH, MSU, NASC, NY, OS, US, WAT). Elgin Co., St. Thomas, shallow water, entirely submerged except for tips with fruit, 12 June 1951, *James s.n.* (DAO). Manitoulin Co., Carnarvan Twp., Mindemoya, Manitoulin Island, road south Mindemoya ca. 1.0 mile north of jct. with Providence Bay Rd., in sluggish stream flowing out of swamp, *Morton 80* (WAT); Carnarvan Twp., Mindemoya, west side of stream on large open marsh ca. 1.8 km south of Mindemoya, *Hellquist & Hellquist 15380* (NASC); Tehkummah Twp., South Baymouth, in swamp at head of small boat docking area, *Morton & Venn NA14834* (WAT); Tehkummah Twp., South Baymouth, Manitoulin Island, the Slash at the head of Leason Bay, in ditch by side of road, *Morton & Venn 10095* (WAT); Tehkummah Twp., South Bay, Manitoulin Island, the Slash, NE of Leason Bay, west side of bridge in stream, *Hellquist & Hellquist 15368* (CAN, DAO, GH, MICH, MO, NASC, US); Tehkummah Twp., Black Creek on east side of Side Road 15 ca. 0.4 km north of Providence Bay Rd., *Hellquist & Hellquist 15379* (CAN, DAO, MICH, NASC, US, WAT). Peel Co., Caledon Twp., Green Lake between 1st and 2nd lines, east side of Hwy. 24, Grid Ref. 795544, abundant in water 5 ft. deep, *Webber & Gregory 12120* (CAN, DAO, MICH, UNA); Caledon Twp., man-made ponds on north and south side of Rt. 24, ca. 0.1 mile east of 2nd Line Rd., *Hellquist & Hellquist 15387* (NASC).

OHIO: Ashtabula Co., Ashtabula, pools, 17 July 1877, *Hill s.n.* (F); Wayne Twp., open, impounded mud bottom ponds on west tributary to Pymatuning Ck. upstream from beaver dams just SE of intersection between Conrail tracks and Woodworth Rd., NE corner of Wayne Twp., occasional, forming dense mats along shoreline, *Bissell & Peskin 30* (MICH, OS). Portage Co., Garrettsville, Silver Ck., *Webb 1272* (F).

MICHIGAN: Cheboygan Co., locally frequent in ca. 1 ft. of water of ditch in boggy ground a few yards east of Elliot Ck. near center E1/2 Sec. 35, T38N, R1W, ca. 4 miles east of Cheboygan, *Voss 12735* (MICH, MSU, UMBS); Grant Twp., in 1–2 ft. of water near the southern shore of the more northerly of the Twin Lakes, Sec. 34, T37N, R1E, 2 Aug. 1951, *Wood s.n.* (GH, UMBS); Grant Twp, north shore of Twin Lakes ca. 5.0 miles east of Alverno, Sec. 24, T37N, R1E, *Hellquist & Haynes 10667* (MASS, NASC, NLU); Grant Twp., southern-most of the two streams flowing into the northern bay of Twin Lakes, ca. 5.0 miles east of Alverno, Sec. 34, T37N, R1E, *Hellquist & Haynes 10670* (NASC). Emmet Co., Wawatam Twp., locally common in ca. 1.5 ft. water, marsh in Cecil Bay between mouths of French Farm Creek, Sec. 28, ca. 4 miles SW of Mackinaw City, *Voss 14061* (CAN, MICH, MSC, NASC, NY, UMBS); Wawatam Twp., French Farm Creek east of Wilderness State Park Rd. at Cecil Bay, Lake Michigan, Sec. 28, T39N, R4W, *Hellquist & Haynes 10484* (NASC); Bliss Twp. Big Sucker Ck., Wilderness State Park, 24 July 1950,

Sparrow s.n. (MICH); Big Sucker Ck. at eastern bridge of Sturgeon Bay Trail, Wilderness State Park, Sec. 34, T39N, R5W, *Hellquist & Hellquist 15300* (F, MO, MSU, NASC, NHA, PAC, UMBS, US). Kalkaska Co., Little Blue Lake, *Ashley 92* (MICH). Mackinac Co., Engadine, abundant at intersection of M-117 & U.S. 2; small stream which runs under M-117 ca. 1 mile south of Engadine, Sec. 20, T43N, R10W, *Haynes 4002* (OS). Manistee Co., Manistee, 5 Aug. 1880, *Hill s.n.* (F, PH, MICH, Type specimens), Manistee, pool on Garfield's farm near Manistee, 14 Aug. 1882, *Morong s.n.* (NY). Missaukee Co., West Branch Twp., ditch, west side of Nelson Rd. just north of Haymarsh Ck., 3.5 miles north by road of Star City, Sec. 1, T23N, R6W, *Pringle 646* (MICH); West Branch Twp., Haymarsh Creek, Nelson Road, 3.5 miles north of Star City, Sec. 1, T23N, R6W, *Hellquist & Hellquist 15293A* (GH, MO, NASC, NY, UNA). Otsego Co., locally common in muddy shallow water along west edge of road at outlet of Grass Lake, center of eastern edge of Sec. 5, T32N, R1W, *Stuckey & Nunan 1300* (GH, MICH, NY, NYS, OS, UMBS, US); southeastern corner of Grass lake ca. 12 miles northeast of Gaylord, Sec. 3, T32N, R1W, *Hellquist & Haynes 10467* (NASC). Presque Isle Co., Bearinger Twp. local in shallow water of Black Mallard River near mouth, NE 1/4, Sec. 25, T35N, R2E ca. 1.0 mile south of Grace, *Stuckey 3182* (OS); Ocqueoc Twp, east side of Little Ocqueoc River south of Rt. M-68, 4½ miles west of Moltke, north side Sec. 25, T35N, R3E, *Hellquist, Hellquist, & Crow 15317* (CAN, F, MICH, MSU, NASC, NY, OS, UMBS, UNA, US).

ACKNOWLEDGMENTS

I wish to thank Garrett E. Crow for his suggestions and manuscript review. Thanks are also extended to the curators of the following herbaria for the loan of plant specimens: CAN, CM, CU, DAO, F, GH, MICH, MO, MSU, NASC, NEBC, NY, NYS, OS, PAC, PH, US, VT, WAT.

LITERATURE CITED

AYENSU, E. S. AND R. A. DEFILIPPS. 1978. Endangered and threatened plants of the United States. Smithsonian Inst. and the World Wildl. Fund, Inc., Washington, D.C. 403 pp.

ARGUS, G. W. AND D. J. WHITE. 1977. The rare vascular plants of Ontario, Syllogeus, No. 14. Natl. Mus. of Nat. Sci., Ottawa. 63 pp.

BOWNOCKER, J. A. 1947. Geologic map of Ohio, with revision by G. W. White, Geol. Surv. of Ohio.

CODDINGTON, J. AND K. G. FIELD. 1978. Rare and endangered vascular plant species in Massachusetts. New England Botanical Club in cooperation with the U.S. Fish and Wildlife Service [Region 5, Newton Corner, MA]. 52 pp.

COUNTRYMAN, W. D. 1978. Rare and endangered vascular plant species in Vermont. The New England Botanical Club in cooperation with the U.S. Fish and Wildlife Service [Region 5, Newton Corner, MA]. 68 pp.

CROW, G. E. 1982. New England's rare, threatened, and endangered plants. U.S. Fish and Wildlife Service, Northeast Region. 130 pp.

CROW, G. E., W. D. COUNTRYMAN, G. L. CHURCH, L. M. EASTMAN, C. B. HELLQUIST, L. J. MEHRHOFF, AND I. M. STORKS. 1981. Rare and endangered vascular plant species in New England. Rhodora 83: 259–299.

DALE, T. N. 1923. The lime belt of Massachusetts and parts of eastern New York and western Connecticut. U. S. Geol. Surv. Bull. 744.

DOLL, G. G. 1961. Centennial geologic map of Vermont. Vt. Geol. Surv., U.S. Geol. Surv. and Harvard Univ.

DUDLEY, W. R. 1886. The Cayuga Flora, Part I. A catalogue of the phaenogamia growing without cultivation in the Cayuga Lake basin. Bull. Cornell Univ. (Sci.) 2: 1–123.

EMERSON, B. K. 1916. Preliminary geologic map of Massachusetts and Rhode Island, in: U. S. Geol. Surv. Bull. 397, "Geology of Massachusetts and Rhode Island", 1917.

FERNALD, M. L. 1932. The linear-leaved North American species of *Potamogeton* section *Axillares*. Mem. Am. Acad. Arts & Sci. 17: 1–183. (also, Mem. Gray Herb. No. 3).

FISHER, D. W., Y. W. ISAACHSEN, AND L. V. RICKARD. 1970. Geologic map of New York. New York State Mus. & Sci. Ser., Map and Chart Ser. 15.

FRAZER, P., JR. 1877. The geology of Lancaster Co. Second Geol. Surv. of Pennsylvania Rep. of Progr. in 1877. 350 pp.

HAYNES, R. R. 1974. A revision of North American *Potamogeton* subsection *Pusillii* (Potamogetonaceae). Rhodora 76: 564–649.

HELLQUIST, C. B. 1977. Observations on some uncommon vascular aquatic plants in New England. Rhodora 76: 564–649.

———. 1980. Correlation of alkalininty and the distribution of *Potamogeton* in New England. Rhodora 82: 331–344.

LESLEY, J. P. 1885. A geological hand atlas of the 76 counties of Pennsylvania: 1885. Second Geol. Surv. of Pennsylvania, Rep. of Progr. X.

MARTEN, H. M. 1936a. The centennial geological map of the northern peninsula of Michigan. Pub. 39, Geol. Ser. 33 (part of Ann. Rep. for 1936).

———. 1936b. The centennial geological map of the southern peninsula of Michigan. Pub. 39, Geol. Ser. 33 (part of Ann. Rept. for 1936).

MEHRHOFF, L. J. 1978. Rare and endangered vascular plant species in Connecticut. The New England Botanical Club in cooperation with the U.S. Fish and Wildlife Service [Region 5, Newton Corner, MA]. 41 pp.

MITCHELL, R. S. AND C. J. SHEVIAK. 1981. Rare plants of New York State. New York State Mus. Bull. 445. Albany. 96 pp.

———., C. J. SHEVIAK, AND J. K. DEAN 1980. Rare and endangered vascular plant species in New York State. The State Botanist's Office, New York State Mus., Albany, in cooperation with the U.S. Fish and Wildlife Service [Region 5, Newton Corner, MA]. 38 pp.

MORTON, J. K. 1977. The flora of Manitoulin Island and the adjacent islands of Lake Huron, Georgian Bay, and the North Channel. Dept. of Bio., Univ. of Waterloo, Ont. 62 pp.

OHIO DEPARTMENT OF NATURAL RESOURCES. 1982. Rare species of native Ohio wild plants. [list]. Ohio Dept. of Nat. Res., Div. of Nat. areas and preserves.

PENNSYLVANIA GEOLOGICAL SURVEY. 1960. Geologic map of Pennsylvania. Pennsylvania. Geol. Surv., Harrisburg.

SALTERLY, J. 1958. Geological map of the Province of Ontario. Map #1958B. Ont. Dept. of Mines.

SMITHSONIAN INSTITUTION. 1975. Report on endangered and threatened plant species of the United States. House Document No. 94–51, Serial No. 94-A, Washington, D.C.

STEVENSON, J. J. 1882. The geology of Bedford and Fulton Counties. Second Geol. Surv. of Pennsylvania. 382 pp.

STAUFFER, C. R. 1914. Geological survey of southwest Ontario. Ont. Dept. of Mines, Map 116A.

WAGNER, W. H., E. G. VOSS, J. H. BEAMAN, E. A. BOURDO, F. W. CASE, J. A. CHURCHILL, AND P. W. THOMPSON. 1977. Endangered, threatened, and rare vasculár plants in Michigan. Mich. Bot. 16: 99–110.

WEBER, W. A. 1940. *Potamogeton hillii* in Berkshire County, Massachusetts. Rhodora 42: 95.

WIEGAND, K. M. AND A. J. EAMES. 1925. The flora of the Cayuga Lake basin, New York. Vascular plants. Cornell Univ. Agric. Exp. Sta. Mem. 92. 491 pp.

WIEGMAN, P. G. 1979. Rare and endangered vascular plant species in Pennsylvania. The Western Pennsylvania Conservancy in cooperation with the U.S. Fish and Wildlife Service [Region 5, Newton Corner, MA]. 94 pp.

Voss, E. G. 1965. Some rare and interesting aquatic vascular plants of northern Michigan with special reference to Cusino Lake (Schoolcraft Co.). Mich. Bot. 4: 11–24.

DEPARTMENT OF BIOLOGY
NORTH ADAMS STATE COLLEGE
NORTH ADAMS, MASSACHUSETTS 01247